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ROCKS and MINERALS

A Magazine for Mineralogist, Geologist and Collector . . .

. . . . . *Official Journal of The Rocks and Minerals Association*

JUNE, 1938

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THE ROCKS AND MINERALS ASSOCIATION

PEEKSKILL, N. Y.

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Organized in 1928 for the increase and dissemination of mineralogic knowledge.

To stimulate public interest in geology and mineralogy and to endeavor to have courses in these subjects introduced in the curricula of the public school systems; to revive a general interest in minerals and mineral collecting; to instruct beginners as to how a collection can be made and cared for; to keep an accurate and permanent record of all mineral localities and minerals found there and to print same for distribution; to encourage the search for new minerals that have not yet been discovered; and to endeavor to secure the practical conservation of mineral localities and unusual rock formations.

Ever since its foundation in 1928, the Rocks and Minerals Association has done much to promote the interest in mineralogy. It has sponsored outings, expeditions, formations of mineralogical clubs and the printing of many articles that have been a distinct contribution to mineralogy.

Those of our readers who are members of the Association can rightly feel that they too were sponsors of these many achievements that have helped to give mineralogy a national recognition. Among your friends there must be many who would like to have a part in the Association's work—to share with you the personal satisfaction, the pleasure, and the benefits of membership. Will you give your friends this opportunity to join the Association by nominating them for membership? A nomination blank will be found elsewhere in this issue.

Each new member helps to extend the Association's activities—helps to make your magazine larger,better, and more interesting, and above all assists in the dissemination of mineralogical knowledge.

Some advantages of membership: All members in good standing receive:

(1) **Rocks and Minerals,** a monthly magazine. (2) A member's identification card that secures the privileges of many mines, quarries, clubs, societies, museums, libraries. (3) The right to participate in outings and meetings arranged by the Association. (4) The right to display a certificate of membership and to place after their names a designation indicating their membership or to advertise membership on stationary, etc. (5) The distinction and the endorsement which comes from membership in the world's largest mineralogical society.

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ROCKS and MINERALS

PUBLISHED MONTHLY

Edited and Published by PETER ZODAC

JUNE 1938

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ROCKS and MINERALS PEEKSKILL, N. Y., U. S. A.

The Official Journal of the Rocks and Minerals Association

Topaz Crystal, Sakangei, Burma, India.
(Original weighs 2½ lbs.)

TOPAZ

Topaz is a mineral whose name at least is familiar to many persons as a beautiful gem set in rings, pendants, brooches, which are common on jewelry counters. Unfortunately the lovely yellowish to brown, transparent stones so often seen are generally not the real topaz but its imitation, citrine, which is a variety of quartz. Topaz is a more precious stone and commands a far higher price.

Topaz is an ancient stone which, according to Pliny, an ancient mineralogist, received its name from an island in the Red Sea. But the stone which actually occurred on this island was a yellowish-green peridot. The island was called Topazion, a Greek word which meant, "to seek", in allusion to the fact that in olden times the island was often so densely covered by a fog that ancient mariners had much difficulty in finding it. During the Middle Ages, the word "topaz" was loosely applied to any yellow stone, but it is now restricted to one definite mineral, the real **topaz**, whose chemical formula is $(AlF)_2SiO_4$, with a hardness of 8, and which crystallizes in the orthorhombic system. Hence the mineral takes its name from an island on which it never occurred.

To the general public topaz is a yellow gem but it also occurs white, grayish, greenish, bluish, reddish; also colorless. It varies from transparent to almost opaque, occurs in almost square crystals, vertically striated, and is also found in massive form.

Though topaz is a very hard mineral, it has such a perfect cleavage, parallel to the base, that one has to be careful not to drop it as the stone may fracture or even split into two or more pieces.

Another unfortunate weakness of topaz is that its colored varieties will often fade when exposed to daylight, and especially to bright sunlight. The lustrous, wine-colored crystals from Thomas Range,Utah, for example, when exposed to the hot sun will in a short time become colorless. On the other hand, wine-colored crystals from Brazil may become pale pink if artificially heated which apparently improves their gem value.

Topaz is generally found in granitic rocks but it also occurs in gneiss, slate, rhyolite and other types. The mineral is quite well distributed and is found on every continent.

In Asia, fine bluish crystals occur at Takayama; fine colorless crystals at Tenagari; fine colorless crystals with orthoclase and smoky quartz at Tamagama Yama; all in Japan. In Siberia, at the Netchinsk district, beyond Lake Baikal in the Adun-chalon Mts., very fine pale blue crystals occur with beryl, orthoclase and smoky quartz; enormous pale brown crystals have been found in the Urulga River. At Sakangei, Burma, India, beautiful pale cherry-colored crystals occur. In Ceylon, yellow, light-green and colorless waterworn pebbles are found in the gem gravels.

In Africa, very fine crystals have been found in Madagascar. Excellent colorless crystals occur at Klein Spitzkopfe, S. W. Africa. Waterworn, colorless pebbles are common in the gravels of the tin mines around Jas, Northern Nigeria.

In Europe, the most noted locality is Schneckenstein (near Auerbach, in Saxony) Germany. Here topaz occurs in a peculiar rock called Topazfels (topaz rock) which is a brecciated mass of tourmaline-quartz rock cemented by quartz and topaz and lined with crystals of topaz with which are associated at times apatite, cassiterite, and chalcopyrite.

In South America, very fine crystals, yellow, blue,green, pink, red and colorless occur in a range of hills near Ouro Preto, Minas Geraes, Brazil.

In North Ameria, localities are numerous but the best known are the wine-yellow crystals of Thomas Range, Utah, which occur in rhyolite.

CHIPS FROM THE QUARRY

PETER ZODAC

Two Remarkable Mineral Pictures In Color

In the January, 1938, issue of THE AMERICAN MINERALOGIST, appeared two of the finest pictures of minerals in color that we have ever seen. The minerals illustrated were an Emerald from Colombia, South America, and Serpentine with Stichtite surrounding Chromite from near Dundas, Tasmania. These very fine pictures in color were special features of **Some Applications of Natural Color Photography in Mineralogy** by B. M. Shaub of Smith College, Northampton, Mass.

Prof. Shaub is beyond doubt the outstanding exponent of colored mineral photography in America. His colored slides are excellent and when shown to illustrate his lecture on natural color photography in mineralogy, a listener is intensely interested. We were privileged to attend one of these lectures given before the Boston Mineral Club, Tuesday, May 3rd, 1938, and we were simply fascinated.

Our congratulations are extended Prof. Shaub for the remarkable progress that he has made in the natural color photography of minerals. Our congratulations are also extended to THE AMERICAN MINERALOGIST and to its popular editor, Dr. Walter F. Hunt of the University of Michigan, for featuring the remarkable colored illustrations. Though THE AMERICAN MINERALOGIST is a highly technical magazine, pictures of minerals in color may be read and understood by even the humblest reader and we hope that more of these pictures may be printed.

A Prize Article Contest

On page 176 of this issue, a Prize Article Contest is announced which should create much interest among our readers. A contest is always of interest to the average individual as it is a challenge to his skill, ingenuity, knowledge, training. Here is an opportunity for any reader of ROCKS and MINERALS to prepare an article on his pet mineral or group of minerals, locality, or trip.

Turn to page 176, read the announcement and rules carefully, dig up your notes and references, get busy on the article and—may the best man win.

Peter Zodac

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The Official Journal of the ROCKS and MINERALS ASSOCIATION

WHOLE NO. 83

. . . AND PALMS FLOURISHED IN GREENLAND

AN EXPLANATORY STUDY OF ALFRED WEGENER'S THEORY OF SHIFTING CONTINENTS.

By WALTHER E. P. HUEBNER

Professor of Geology and Physiography, New York

EDITOR'S NOTE: This is the second of a series of articles on Geology and Physiography written by Prof. Huebner for ROCKS and MINERALS. His first article "JOHN DOE AMONG THE DINOSAURS" A CONSTRUCTIVE STUDY ON MUSEUMS OF NATURAL HISTORY appeared in ROCKS and MINERALS in November 1937 together with a short biography of the author. Mr. Huebner is now actively engaged in foraminiferal research work in reference to stratigraphic correlation for the benefit of the oil industry.

A glance upon the globe will show a very striking fact. Even to the most casual and uninitiated observer the Atlantic coast lines between Africa and South America look like two big pieces of a jig-saw puzzle just waiting to be put together. This marked similarity becomes still more startling when minor details of the opposite coasts are examined. Not only has the large rectangular bend of the Brazilian shore at Cape San Roque its true negative counterpart in the deep recession of Africa at the Gulf of Guinea, but each smaller projection and indentation on both sides of the Atlantic also fits perfectly into one another. Of course, the outer edges of the continental shelves have to be considered as the true margins of the continents. This and many other "fits" all over the globe might be just a strange coincidence without any inherent meaning whatsoever.—If, however, the paleontologists tell us that in former periods of the earth palms and other tropical plants were growing in

Prof. WALTHER E. P. HUEBNER

Greenland and Spitsbergen in a region now absolutely under the domain of a rigid polar climate,—if geologists show us that there have been ice ages in South America, Africa, India, and Australia in regions now distinctly tropical, —if from all quarters of the earth a host of other fossil climatic witnesses

can be marshaled all pointing to climatic conditions very different from those obtaining there today,—then we stop and listen and think. In trying to bring these facts into harmony with the present distribution of continents and zonal arrangement of climates we become hopelessly lost in a maze of contradictions and impossibilities. However, order is brought into this chaos when we accept the facts and conclusions which led Alfred Wegener to his famous theory of continental drift.

In order to come to a thorough understanding of this theory we may first get a glimpse of what our earth looks like when cut right through the center. Gravitational and seismologic observations have shown that the solid earth is made up of two roughly concentric shells and a core the specific gravity of which progressively increase as one approaches the center. The outer shell, represented by our continents and existing, therefore, in patches only, has a thickness of about 70 miles. The main constituents of its rocks are silicon and **al**umin**i**um. The second layer with a thickness of about 1000 miles is made up mostly of silicon and magnesium. The huge remaining core has a radius of about 3000 miles primarily with the ingredients **ni**ckel and iron (**Fe**). As proper abbreviations of these three zones, taking the first two letters of each element, the terms "sial," "sima," and "nife" have been chosen. (fig. 1)

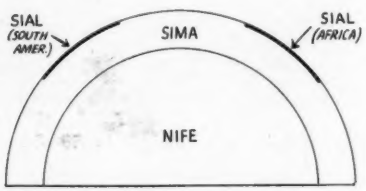


Fig. 1

Great-circle section through South America and Africa. Modified after Wegener: Die Entstehung der Kontinente und Ozeane.

According to the doctrine of isostasy the lighter sial crust floats in and on the heavier substratum sima just as an ice cake floats in and on water. The sial is deeply immersed in the sima—about 65 miles—and projects but slightly above it (about 3 miles). It has further been shown by gravity measurements that this floating sial crust is isostatically compensated. Mountain chains are found to have a distinct mass deficit, whereas there is over the ocean a marked mass surplus. This is seemingly paradoxical and just the opposite as one would normally expect. The meaning of this simply is that under mountains the heavier sima occurs at greater depths, the sial bulging downwards underneath the crest of the mountain chain. On the other hand, the sial becomes progressively thinner as one approaches lowlands and the floor of epicontinental seas (shelf seas). According to Wegener it is altogether lacking at the bottom of the deep sea. Here the sima forms the floor of the abyss. (Figs. 2 and 3.)

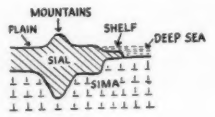


Fig. 2

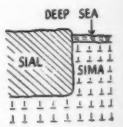


Fig. 3

Fig. 2—Section through the lithosphere according to isostasy and to Wegener. Modified after Wegener.

Fig. 3—Arbitrary section through the edge of a continent. Modified after Wegener.

We may reasonably assume that in very ancient geological periods the sial was spread out evenly over the whole earth. Its thickness, then, was appreciably less than 70 miles. Most probably it was enveloped entirely by the waters of the earth forming one primordial ocean, the so-called "Panthalassa." This primeval sea must have had an average depth of less than 2 miles, whereas today it is about 3 miles. Due to the ever-acting forces of tidal

friction a steady westward pressure is exerted, since the daily tides are running around the earth in this direction. By this relatively mild, but continuous push against the crust this first sialic cover was ripped open meridianally. As this fissure progressively broadened the heavier substratum, the sima, was bared. The waters of the primeval sea ran into this ever-widening trough which grew to become the first ocean. We have reason to believe that this first incipient ocean was the Pacific in its primordial shape. This ancestral Pacific, finally, became so large as to hold almost all the waters of the globe in its vast, gaping depression. Thus the sial crust became almost entirely exposed forming the first primitive continent, the so-called "Pangaea" which included all our present continents in one vast block. Now just as a huge ice cake, due to its lesser density, floats in water and is drifted about as winds and currents will have it, so our sial block Pangaea is drifting along floating in the heavier sima and obeying the constant westward push of the daily tides. And just as a vast drifting ice cake is crumpled and shattered at its edge when striking an obstacle, so the westward-drifting sial block was crumpled up at its front due to the resistance it encountered in the extremely viscous sima paste. The front of our sial block were the incipient coast lines of the western Americas, its back roughly coinciding with the eastern shores of Asia. This first folded mountain chain, running along the entire "American front" of the sial block from pole to pole, were the Paleo-Cordilleran Mountains, the forerunners of our present American Cordilleras. At its "Asiatic back" the drifting Pangaea was continually losing bits of its sialic substance which were torn off due to the arresting strain exerted by the extremely viscous sima paste. These broken-off fragments were left behind as the "festoons," islands, and island groups of the Pacific.

The ceaselessly-operating tidal forces brought about a second period of renewed fissuring and rift building in Jurassic and Cretaceous times. Then, on both sides of present Africa, our Pangaea split open in a set of fissures which separated off several smaller blocks. These new fissures gradually widened into the Atlantic and Indic oceans and the smaller blocks formed our present continents. Rifting will go on and on with the result that the continents will become more in number and smaller in areal extent. That this meridianal fissuring is still going on today and may be observed in its formative stage, is shown by the grandiose example of the East-African rift valley system. Extending over 50 degrees of latitude from Palestine to South Africa it encompasses the following geographic features: the Jordan Valley, the Dead Sea, the Gulfs of Suez and Aqaba, the Red Sea, and the African Lakes Rudolf, Albert, Edward, Kivu, Tanganyika, and Nyasa. Many instances may be cited of left-behind bits of sial substance in the wake of continental drift, showing either a lagging movement toward east but still clinging to their parental blocks, or entirely detached as islands, island groups, or island festoons, e.g: the Malay Peninsula, the Sunda Islands, Ceylon, New Zealand, Greater and Lesser Antilles, Southern Antilles between South America and Antarctica, the Florida shelf, the southern tip of Greenland, the Abrolhos Bank off the Brazilian coast, the southern extremity of South America and its opposite point of Antarctica beyond Drake Strait, Madagascar, and the mid-Atlantic submarine ridge.

Tidal friction, however, is not the only force which keeps the continents "going." An important role is also played by the centrifugal force set up by the rotation of the earth. This force causes the continents to drift away from the poles and to crowd towards the equator. So the vast Eurasian belt of folded mountains of which the Alps and Himalayas are a part came into existence in Tertiary times. The equatorial belt—at that time situated there—was caught by the equatorward-pressing earth blocks as between the jaws of a

vice and reared up to the lofty heights of this mountain system. So was, many million years farther back, the Carboniferous mountain belt folded up on both sides of the Carboniferous equator. The equator at that time ran through North America, Europe, and Asia and is still recognizable in the enormous coal belt encircling the entire globe. That we do not find an equatorial mountain system on our present equator is due to the vast time-element involved in the process of adjustment. The continents will always lag behind in response to tidal friction and centrifugal force. Their mass, inconspicuous as it is compared with the bulk of the underlying sima, is nevertheless so tremendously great and the resistance they have to battle with while dragging themselves wearily through the extremely stiff sima paste is so strong, that any adjustive change in movement requires many millions of years to become noticeable in its effect. But they always have been and are adjusting themselves to any new force effecting their position on the globe. . . . A few more examples may be cited to show the continental drift away from the poles. AUSTRALIA is now moving toward northwest which is evidenced by the relatively young mountains of New Guinea at the front of the Australia-New Guinea block and also by the detachment and lagging behind of New Zealand toward southeast. This same block, while ploughing through the eastern Malay Archipelago has distorted and curved smaller sial fragments left behind the "Asiatic back." The islands thus affected belong to the Bismarck Archipelago and Banda Sea. (Fig. 4.)

Another interesting example of equatorward drift is shown in the so-called "LEMURIAN THRUST." In late Triassic time Madagascar and India were still attached to Africa and then separated from "Asia" by a 2000 mile stretch of shelf sea. Since early Jurassic times this Madagascar-India block is thrusting itself into the very heart of Asia and the path of destruction is still plainly visible. In early Tertiary times this sial block ploughing through the sima lost in its wake Madagascar which "got stuck" where it is today while the main mass was pushing on toward northeast. Thereby the "horn" of Africa, the Somali Land, was dragged around toward north causing among other things which we have to omit here the upfolding of the Abyssinian Mountains. The "spur" of the Arabian Oman Mountains was thrust into Persia. The entire 2000 mile sialic stretch of shelf sea was shoved together and rests today deeply buried in the Himalayas in which the western end of the thrust is recognizable in the Hindu Kush, the eastern in the Burma ranges. The latter ranges have been straightened out meridianally by this thrust from their normal for-

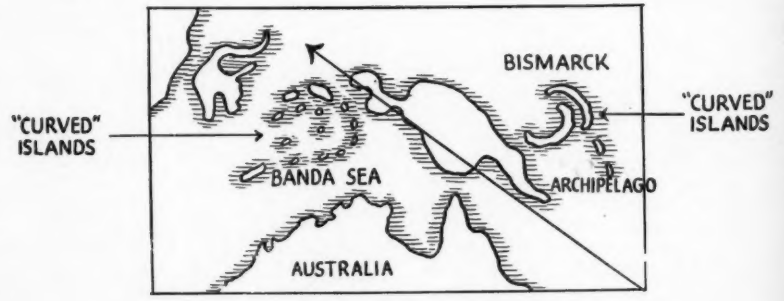


Fig. 4—Map showing the northwest drift of the Australia-New Guinea block. Modified after Wegener.

mer strike trending NW-SE. The échelon-arrangement of the ranges between Hindu Kush and Lake Baikal is due to lateral shearing stresses of the crust in consequence of this Lemurian thrust. These shearing stresses will be explained more fully farther down. . . . In NORTH AMERICA we have at present a general trend toward SW, this being a component of the westward drift as wel as of the equatorward migration of this continent. In arctic North America we find Grant and Parry Islands and Labrador displaced toward southwest in reference to Greenland. In California we notice drag phenomena in the backwards-pointing coastal projections of Lower California. The tip of the peninsula is thickened like an anvil due to frontal resistance on its way southward. For that matter, the whole peninsula is noticeably shortened and does not fit at all any more into its negative of the Mexican coast. This lagging behind of Lower California in reference to the general southwestward trend of North America has set up shearing processes which are at work to detach the outer coastal range of California entirely from the mainland. Finally, it will be left behind as an échelon festoon likewise as the Aleutian Islands, Kamchatka and the Kurile Islands, Sakhalin and Japanese Islands, and the Ryukyu Islands and Formosa. They all have been separated from the mainland as échelon festoons due to shearing stresses acting obliquely on Asia's "back." In California the shearing movements slide along one another in opposite directions and have been the cause of the famous San Andreas fault farther north in consequence of which the great Californian earthquake of 1906 occurred which laid San Francisco into ruins. Here, too, the bulging convex outline of the coast points to compressional thrusts. (Fig. 5.)

Space does not permit to bring more "proofs" of this highly suggestive theory. A multitude of geophysical, geological, paleontological, biological, paleoclimatical, and geodetic evidences are available which all tend to strengthen this belief. Their proper enumeration would fill a book. But even this meager outline enables us now to satisfactorily account for the strange title of this article "...AND PALMS FLOURISHED IN GREENLAND." In early Tertiary times the north pole was in the neighborhood of the Aleutian Islands in the northern Pacific which places Greenland and Spitsbergen in a subtropical latitude. Still farther back, in Carboniferous times, Spitsbergen and Greenland lay in the tropical zone, the north pole in the middle of the Pacific and the south pole in South Africa. The glacial deposits and other fossil records of the Permo-Carboniferous ice age are scattered mostly through the present tropical zone over the whole globe: in South Africa, Brazil, Argentina, Togo, the Congo Basin, India, and Australia. We can bring sense into this phenomenon only by "turning all continents back again" around Africa, place the south pole in South Africa and the glaciated area will be not larger than it was in Pleistocene times. At that time the "Atlantic fissure" was still closed in these high northern latitudes and did not open until mid-Pleistocene times. North America, Greenland, Iceland, and northern Europe were still closely connected. The north pole must have been in Greenland which accounts more than well for the fact that Alaska and northern Siberia were untouched by glaciers. This would have been impossible, if

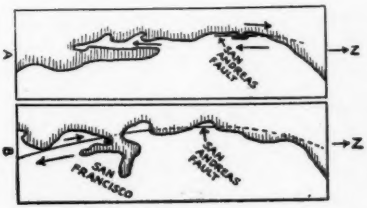


Fig. 5

A)—Map of California showing shearing stresses.

B)—Map of San Andreas fault in California.

the north pole had been where it is today.

A few more words may be said in reference to some geologic phenomena which will be seen in a new and interesting light through this theory:

A. VOLCANISM: No definite boundary level exists where sial and sima meet in the depths of the earth. Both layers, differing but slightly in density, are rather interpenetrating and interfingering each other at the transitional zone. So it is obvious that bits of the viscous sima will be found interspersed among the sialic blocks in "peripheral magma reservoirs" as Stübel calls them. These satellitic intrusions or sima pockets will be readily squeezed out of the sial when subjected to severe crushing and so give rise to our terrestrial volcanic phenomena. (Fig. 6.)

B. TRANSGRESSIONS AND REGRESSIONS: Consequent to a relative shifting of the poles—there is no absolute actual shifting of the earth's astronomical axis which occupies always the same position in space—it will take the continents thus affected a considerable time to adjust themselves to the new condition. On the other hand, the hydrosphere being fluid is not lagging behind but will take up its new place immediately. Therefore, we shall expect a "regression"—receding ocean—in front of the migrating pole and a "transgression"—encroaching ocean—back of it. (Fig. 7.) If we follow the course of transgressions and regressions on our reconstructional charts during geologic history, we find this anticipated law for the first time actual verified.

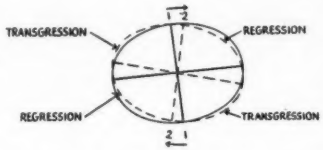


Fig. 7—Transgressions and regressions due to the migration of the pole. Modified after Wegener.

C. EROSION OF MOUNTAIN CHAINS: Let us assume that the sedimentary cap of a mountain chain has an original thickness of 3 miles. After prolonged erosion, the whole sial block carrying on and in itself this mountain chain will rise in isostatic compensation to make up for the loss of sedimentary weight carried away by the rivers. Therefore, a central gneiss core—a sial block is made up mostly of gneissic material—will appear this being still flanked on both sides by sediments. After further prolonged denudation the flanks, too, will be stripped of their sedimentary cover, the block will rise again, and nothing but gneiss will be exposed on the site of the former mountains. (Fig. 8.) These 3 stages are well represented by the Himalayas with most of their sedimentary cover still intact; by the Alps with their central gneissic core and sedimentary flanks of limestones and sandstones; and the Highlands of Norway with their bare gneissic stretches throughout their length and breadth.

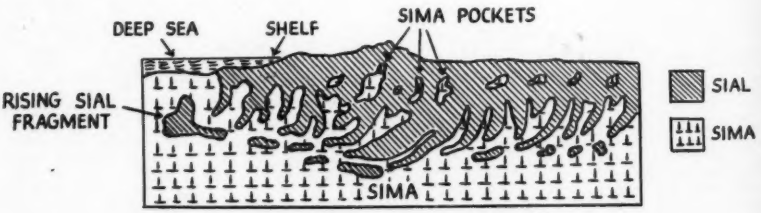


Fig. 6—Section through a sial block. Modified after Wegener.

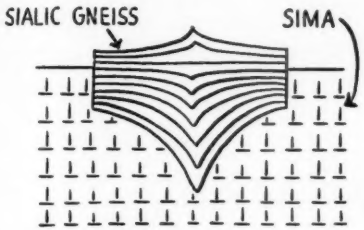


Fig. 8—Erosion of mountains according to isostasy. Sediments omitted. Modified after Wegener.

D. FOLDING, FAULTING, AND RIFTING: Folds, faults, and rifts are related to each other genetically. They are produced according to the varying direction of movement of two earth blocks relative to each other, one being rigid and stationary—a "resistant buttress," as it is called—the other moving towards, or away from, it in various directions. If the movement of the active block is head on toward the rigid one, compressional movements will result in normal folds and thrusts. A more oblique movement will set up compressional shearing originating échelon folds. A movement parallel to the stationary block will result in transverse shearing processes producing what is called a "flaw" or transverse fault. If, on the other hand, the movement is away from the rigid block, tensional stresses will be operative occasioning oblique and normal fissuring and resulting in rifting as seen so beautifully in the "Rhine graben" of Germany and the East African rift valley system. (Fig. 9.)

Although in Wegener's theory a few things are still open to discussion or need explanation this theory of shifting continents and migrating poles certainly has one great advantage over other

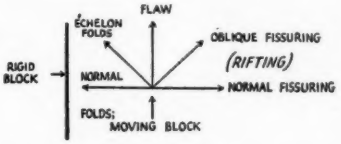


Fig. 9—Folding, faulting, and rifting. Modified after Wegener.

theories touching on the same subject. It has an answer to most problems—and a plausible one at that—where other theories must be silent or become hopelessly confused. The doctrine of continental drift is a very workable thought and is winning more and more followers every year on this side of the Atlantic. It brings a logical unit into the multifarious wonders of our earth and it has shown us for the first time that continental drift, migrations of poles and equator, transgressions and regressions, folding and fissuring, volcanism, and other geological phenomena are an integral part of one continuous series of cause and effect. . . .

Stephen Varni Co. Expand

The Stephen Varni Co., gem dealers of New York City, have recently added to their selling force, Miss Rowena Loane, graduate of Colby College, Waterville, Me., and former student of School of Museum of Fine Arts, Boston, Mass.

The complete selling force of the company is now:

Stephen Varni, New York City and East Coast—Maine to Florida.

William Weber, Office and New York City environs.

Miss Rowena Loane, New York City and New England.

BRECKENRIDGE GOLD

By ALLAN CAPLAN
Box 42, Golden, Colorado

Breckenridge, Colorado, from the mineralogical viewpoint, has become world famous for its fine examples of crystallized gold. Numerous institutions were fortunate to secure fascinating collections of the glistening gold, but relatively few were secured for private collections. The finest collections were owned by the mine operators; fortunately, these were donated to museums and institutions.

If small private collections were in existence during recent years, the mint finally obtained them during the worst years of the depression. Today, it is very difficult to find a specimen for a collection, since the rich mines have been worked out for many years. Several properties are operating on a small scale, but the ore is low-grade. A gold dredge or two is still scratching bedrock, but real specimens are rarely obtained.

LOCATION

The Breckenridge district is in Summit County almost in the center of the State of Colorado. The area lies on the western slope of the Continental Divide of the Rocky Mountains at an elevation over 9,500 feet. Numerous 13,000 foot peaks of the Continental Divide loom over the rolling foothill topography and the flat Blue River valley. The valley is rather narrow yet fairly open, and is gravel-filled from the foot of Loveland Pass on the north to the foot of Hoosier pass on the south, a distance of about 14 miles. The lofty, snowy peaks of the Divide have been carved by alpine glaciers to form jagged pinnacles and cirques. The lower slopes and valleys have also been altered by glacial cutting and detritus deposition in the form of moraines and reworked gravels.

GEOLOGY

The area of the Breckenridge district is composed primarily of Pre-cambrian granites, gneisses and schists with remnants of Paleozoic sediments existing. The same Pre-cambrian rocks extend under the Paleozoic sediments of the Aspen and Leadville districts. Intrusive porphyries of the late Cretaceous or early Tertiary which resemble the porphyries of the Leadville area are present in the form of huge, sheet- like masses and dikes. The mineral-bearing fault-fissure veins are closely related to the porphyry intrusions. Large fault zones are rarely mineralized; it is the smaller faulted zones which contain economic mineralization.

HISTORY

Like Leadville and other mining districts of Colorado, Breckenridge owes its discovery to the surge of westward migration of 1859. In the numerous tributaries which flow into Blue Creek, placer operations commenced, towns were established, and people settled. Breckenridge is the lone survivor—the others are gone. Huge piles of river boulders in endless succession remain as the monuments of the busy hydraulic and dredging operations of the early days.

It was not until 1869 that lode mining began, and this was a rich argentiferous galena ore which was hauled in wagons to the smelters in Denver and Golden. Strange as it may seem, gold was not found in place until twenty years following the discovery of rich placer deposits. This may be accounted for, however, since the veins of Farcomb Hill are narrow and fail to outcrop. For ten years after the discovery, Farcomb Hill was criss-crossed with tunnels, drifts, and shafts in order to find the pockets of beautiful crystallized wire and leaf gold. During this period, the numerous specimens were procured;

but as the pockets became difficult to find, development of the area declined for a short period.

A revival of activities in 1885 started with the influx of organized companies which developed the larger low-grade gold veins and persistent lead-silver veins. As the ore was slowly mined, activity declined until the year 1909 when most of the mines were in an abandoned condition. Since then, activity in the district has been irregular and with small production.

CRYSTALLIZED GOLD

Although such minerals as bismuthinits, malachite, azurite, cerussite, smithsonite, galent, sphalerite and others were produced, they are insignificant when compared with the superb native gold production of the area. Thousands of dollars worth of crystallized gold was saved from the mint because of its exquisite beauty. In the John F. Campion Collection in the Colorado Museum of Natural History, masses of crystallized gold as heavy as thirteen pounds have been preserved for posterity. A much smaller but similar collection containing close to $5,000 in gold is preserved in a collection at the Colorado School of Mines in Golden.

The best locality of the district was Farcomb Hill where the pockets were found in small veins. In general the gold was found in irregular masses of leaf gold, consisting of thin septa which meet at angles suggesting a deposition which was controlled by the cleavage planes of rhombohedral calcite. The sides of these septa are composed of small triangular faces of octahedrons up to 3 millimeters in diameter. Often depressions are found on the crystal faces.

Even more interesting is the wire gold which was more fragile and difficult to secure. Crystalline wires as long as 3 inches are bunched and twisted into one mass. The wires vary in size and shape a great deal, for some are short and stout, while others are long and hairlike. Some are striated, others are a series of small crystals end on end. A cross-section of the wires reveals a variety of shapes. The wires may be square, oval or ribbon-like. Under close examinations, no two wire gold specimens are alike.

A fine specimen of crystallized Breckenridge gold.

The gold, however, was rarely found clean and bright as the display specimens, for they were normally embedded in an earthy matrix of reddish color containing limonite, oxides and carbonates of copper as well as other vein minerals. A bath in hydrofluoric acid removed all undesirable material to reveal a gorgeous specimen of brilliant crystallized or wire gold.

Reference: "Geology and Ore Deposits of Breakenridge District, Colorado" by Frederick Leslie Ransome.

THE ROYAL GORGE

By F. C. KESSLER
Canon City, Colorado

"Zoom," went the earth up in the Rocky Mountains near central Colorado and a crack ran down toward the east as if a giant skater in the early ice-age had propelled himself with a mighty stroke and rent the country-side asunder, leaving the fissure to become famous later as the Royal Gorge.

But this is a layman's idea of how the gorge was formed. A geologist would point out that the gorge cuts across the lamination of the schists and gneisses that constitute its walls. He would contend that an earthquake would have opened up one or more of the seams at the contacts. This would have placed the gorge north and south rather than east and west as it really is. An earthquake could fill it up at one blast, but there is probably no evidence anywhere of a gorge ever having been made by volcanic action.

In a co-operative project between the practical arts classes and the geology club at Canon City, the framework of a clay model map of Fremont County was made. Layer after layer of one-fourth inch building board was used to represent each two hundred feet of vertical elevation of a contour map of the county. When the project was finished, the builders "found out" more than they learned in the building process. The county is 59 miles long and 30 miles wide with the Arkansas River running length-wise through it. Near the northern boundary the elevation is from 9,000 to 11,000 feet. On the south, it runs from 10,000 to 12,500 feet. The Royal Gorge, through which the river flows, is about midway in the county with an elevation at the bottom of 5,800 feet, and at the top, 6,900 feet. When one looks at the structure, he can see at a glance that the gorge is only a small part of the entire canon of the Arkansas, which has cut its way through Fremont's Peak. The gorge itself is only 880 feet wide at the top.

The valley, in the high country of Colorado, suggests three distinct ages. The upper valley is old and wide, seven or eight miles in places from Howard west. In this part are numerous cattle ranches and several thriving towns—Salida and Buena Vista are examples. Between Howard and Parkdale, just west of the Royal Gorge, the valley is U shaped, and is probably much younger than the upper part. In this section are mining properties and marble and granite quarries. The Salida Rose Pink and the Colorado Supreme granite monumental stone, as well as the beautiful buff travertine, so common in Denver buildings, are quarried here. The towns in this section are mere stations along the highway and the railroad. There is no room for ranches or farms. The walls are bare rock. From Parkdale to Canon City the canon is young. It is V shaped and narrow. In many place the walls are perpendicular. It is truly a gorge and the name Royal Gorge is quite appropriate for it, because there is probably no other scenic attraction in Colorado featured more profusely in advertising literature than this unusual spot. At one place it is so narrow, there is not room enough for both the river and the railroad. In this instance, the engineers built a hanging bridge along the side by means of trusses anchored to either side of the walls and laid the railroad across it, so that the river has full possession of the bottom, and flows under the bridge unobstructed by supports or undermining.

What the club "found out" when their work was completed is that there must have been at least two periods of elevation in the folding process of the mountains between the Great Plains and the top of the range. One raised the section between Parkdale and Howard, because the canon there is narrower than it is above. The other raised the section between Canon City and Parkdale, because the canon there is narrower than the part next above it. Erosion has taken its toll even to the extent of carving a channel through the hard granite at a rate as rapid as the orogenic movements that raised the mountains up.

Courtesy of Canon City Chamber of Commerce.

Note the high bridge at top of photo. It was built by the Engineer, L. P. Piper and belongs to the Royal Gorge Bridge and Amusement Co. The high bridge is 1053 feet above the hanging bridge, two of whose trusses are just behind the first coach of the train.

PRIZE ARTICLE CONTEST

Two generous members of the Rocks and Minerals Association, have contributed $50 to be divided into three prizes for a good, better, and best article on some mineralogical subject. The first prize will be $25, the second $15, and the third $10.

It is the thought of the donors that by this encouragement more comprehensive articles of length and originality, stressing the side of popular interest yet not omitting some scientific content, might be written for the pages of ROCKS and MINERALS. Other than the articles should be addressed to ROCKS and MINERALS, this magazine has nothing to do with the running the contest. All such mail as is addressed to the Prize Article Contest will be turned over to the judges.

The rules of the contest are as follows:

Articles must deal with some mineralogical subject with emphasis on popular appeal and general interest yet with some scientific aspect included. For instance, if a collecting trip is described, something of the occurrence as well as a description of the minerals collected should be treated. Photos, maps, etc., are not necessary but could serve to make an article more interesting. These should be in shape for publication.

Articles must be typewritten (keep a carbon copy for your files), from 4,000 to 6,000 words in length, and as each will be judged anonymously, the author's name should not appear on it. Have two title pages for each article. On the first, type the name of the article and your name and address; on the second title page type only the name of the article.

All articles must be submitted between June 1st, 1938 and midnight of October 15, 1938.

Address them to

PRIZE ARTICLE CONTEST, **ROCKS and MINERALS**, PEEKSKILL, N. Y.

All entrants must be members of the Rocks and Minerals Association.

No article will be returned (if not a prize winner) unless a self-addressed, stamped envelope is enclosed with it. Furthermore, all articles submitted in the contest will be held subject for possible publication in ROCKS and MINERALS.

The judges in the contest are: Dr. Frederick H. Pough of the American Museum of Natural History, O. Ivan Lee, and Arthur Montgomery, all of New York City.

The prize-winning articles will be announced in the January, 1939, issue of ROCKS and MINERALS and published in the early issues of that year.

A Worthy Suggestion

Dear Editor:

Here is one way in which our hobby, mineralogy, can be brought to the attention of the general public.

Every town and city has a public library. The buildings in general are equipped with an exhibition room or foyer with one or more glass show-cases. I have found that librarians are delighted to accept a temporary loan exhibit of minerals, if the specimens are properly labeled and interesting in form and color.

After an exhibit is installed, have the librarian 'phone the local newspaper about it. The paper is usually willing to send a reporter to examine it and to print a nice write-up.

I have had two such exhibits in public libraries, one in Jamaica, N. Y., several years ago, and the other is now being shown in New Rochelle, N. Y. Both exhibits have attracted hundreds of interested persons and both times the local newspapers have given them plenty of publicity.

How about some of our ROCKS and MINERALS readers putting on exhibitions in **their** public libraries?

May 5, 1938.

Stanley Harzfeld,
New Rochelle, N. Y.

MINERALS IN THE DOMINICAN REPUBLIC

By DR. WILLY LENGWEILER, Geologist

Carib Formation

With this name the author classified a family of minerals which presents itself in this country in the form of a strongly mineralized rock-belt. This geological formation starts with the range of the Black Mountains (Sierra Prieta) in Villa Mella, Trujillo Province, and has its end with the Peguera Hill (2), near Buena Vista of Jarabacoa. The width of this belt is an average of about 10 kilometers (6 miles), and a length of 90 kilometers (56 miles).

Behind the above mentioned Black Mountains, the formation runs to Peguera Hill (1) (there exists two hills with the same name but fairly distant from each other) between Piedras Blancas, Maimon, and Bonao, situated on the Duarte Highway; Carib Hill (Loma Caribe) on the northern end of the strong steel bridge over the Yuna River in Bonao; to Miranda Hill (Loma Miranda), west of the village of Rincon on the same highway, between the Camú River and the Yamí Creek, or the road from La Vega to Jarabacoa.

This family of minerals, discovered by the author for the first time in the Carib Hill and called by him in accordance to this location "Carib Formation", is composed of serpentine, garnierite, cobaltite, chromite, and magnesite. So congenital are these minerals that if one kind is found the others are not far away.

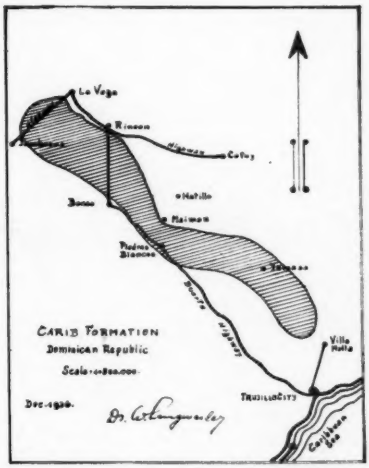
Let us have a look. On the Black Mountains, the commercially important mineral is garnierite (silicate of nickel), but in intimacy with magnesite, serpentine, and chromite.

In the Carib Hill and Peguera Hill (1), chromite abounds but garnierite also is present. The gangue is a hydrosilicate with a serpentine fill.

Port Hill is composed of serpentine with small cobaltite veins; and Peguera Hill (2) of hydrosilicates with chromite

The northwest range of Peguera Hill (1) has a thin stratum of magnesite over a solid hydrosilicate with a serpentine fill.

The basis of Miranda Hill is a solid serpentine but higher up on its slopes appear hydrosilicates, small fissures of cobaltite and chromite. The commercially valuable ores of this Carib Formation are chromium, cobalt and nickel.



Notorious is New Caledonia, a French possession near the Australian Continent, on account of its abundance of chromium and nickel ores. The nickel presents itself likewise in silicates, chiefly garnierite, with serpentine, chromite and cobaltite. For this correlation, the mineralogical structure of that far off island is to be considered nearly identical with the Carib Formation in the Dominican Republic. The New Caledonian garnierite has another chemical characteristic in common with the same ore from Dominican Republic, namely to enrich itself in metallic value through exposure to atmospheric influence.

In New Caledonia, rich nickel ore is almost always found in deposits near the surface and in groups of pockets. It is being mined in open cuts, 100 to 200 meters long, with steps of 8 meters high and with 3 to 12 levels. In the Dominican Black Mountains, the highest grade of garnierite is also found near the surface and it loses its metallic value with depth.

The French Government, owner of the New Caledonian mines, exports the ores to Europe and to the United States of America, in spite of the very serious problem of laborers, who are being regularly imported from China and Japan, and also in spite of the long and costly freight charges to the ports of market.

Chromium Ore

The chromium ore (chromite) from the Dominican Republic is associated with hydrosilicates and serpentine as has been mentioned. It is found in Peguera Hill (1) and Carib Hill, the first on the Duarte Highway between Piedras Blancas, Maimon and Bonao; and the latter on the northern side of the Yuna River.

This mineral occurs in pockets with more or less quantity of ore but never in veins or lodes. Excavations have been made by the author which at a depth of half a meter exposed large chromium ore blocks and there are other sites where pockets of ore protrude to the surface in the form of outcrops. The chromium ore blocks are regularly associated with iron ore blocks of fine grade. On both hills, sporadic chromium ore boulders are found on the surface.

Chromium ore found here is very brittle and large blocks can be pulverized with little effort. This characteristic must be taken into serious consideration should shipments be made of this material.

Dominican chromium ore has been assayed several times in the United States and the average of 9 assays give 55.04 percent of chromium oxide with less than ½ of iron content. This percentage may be considered rich as the standard percentage runs only to 50 percent.

Transportation from the ore sites is not at all difficult, as Trujillo City, the shipping port, is nearby.

Nickel Ore

In the Black Mountains near Villa Mella, Trujillo Province, garnierite, a silicate of nickel, is present in abundance together with serpentine. In these hills some important exploring excavations have been made in the search for nickel. Mr. D. Dale Condit[1] obtained 22 samples of mineral from different sites which gave an average of 0.726 percent nickel. Some of the samples ran as high as 3.01 percent nickel which were collected at the summit of the hill and nearly on the surface. But the percentage of nickel decreases as excavations deepen.

Mr. Condit stated that it seemed "the material enrich itself through atmosphere action."

Garnierite appears in Peguera Hill (1) and in Carib Hill. In both sites the nickel ore is in a gangue of hydrosilicates, sometimes in greenish or in blackish serpentine. The presence of nickel in a serpentine gangue is more desirable from a commercial standpoint than in a hydrosilicate gangue, as the treatment is less expensive.

Mr. Condit further says: "It is possible that future explorations in the adjoining serpentine rocks may reveal a more valuable ore deposit. Nickel in a form more or less disseminated used to be a constitutive element of serpentine, and therefore, the deposit in Sierra Prieta is not the only one of this kind. The unfavorable results of the explorations there made should not produce a disillusion as to explorations to be made in other parts of the Dominican Republic, where large extensions exist of terrain covered with serpentine."

These "large extensions of terrain covered with serpentine" are found near the village of Rincon in the Miranda Hill. Future explorations should be directed in this way as the serpentine stratum is very solid and of a considerable depth, sometimes showing some mica lenses. Occasionally, rocks can be seen with apple-green spots demonstrating the chemical presence of nickel salts.

Ways of transportation of this ore is not very difficult as the Black Mountains rise from the coastal plains near Trujillo City, and Peguera Hill and Miranda Hill are on the Duarte Highway.

[1] Condit, D. Dale, **A Geological Reconnaissance of the Dominican Republic.** Washington, D. C.

Cobalt Ore

In spite of the fact that in different parts of this country small veins of cobalt ore (cobaltite) are found, nevertheless, not a lode has been found as yet with sufficient capacity to be exploited commercially.

Magnesium Ore

Very small is the amount of magnesium ore (magnesite) present in the Dominican Republic. Up to date the author has found only a thin layer covering serpentine and hydrosilicate rocks in the western part of Peguera Hill (1) in Bonao. This stratum has not enough quantity of the mineral for a mining industry.

VERDE ANTIQUE, MARBLE USED TO BEAUTIFY ROME, PRODUCED IN VARIOUS STATES.

Verde Antique, a beautiful green serpentine marble which was used by the Emperor Augustus in making good his boast that he would transform Rome from a city of brick to one of marble, is produced in Vermont, Massachusetts, Maryland and other States, according to the Bureau of Mines, Department of the Interior, which has conducted a study of the subject.

In consequence of the boast of Augustus, made a few years before the beginning of the Christian era, marble was for several centuries the most popular building material, not only in Rome but throughout the entire Roman Empire. The most beautiful marbles the world could furnish were sought, and among them was an exquisite green and white variety quarried in Thessaly, northeastern Greece. So extensive was the use of this product that the wheels of the oxcarts on which the blocks were hauled along the Vale of Tempe road to the Aegean Sea wore deep furrows in the solid rock. After the Turkish invasion of Greece, the quarries were lost for several centuries and were rediscovered only about 40 years tico, was the forerunner of a great variety of green serpentine marbles classed under the general heading of "Verde Antique." They have long been quarried in Greece, Italy, France, England, Ireland and other foreign countries.

Several very beautiful verde antiques are obtained in the United States, particularly near Roxbury, Vermont; Westfield, Massachusetts; and Cardiff, Maryland. They are used principally as ornamental building materials such as columns, baseboards, panels, floor tile, store fronts and bank counters. Their polished surfaces show attractive contrasts of green, white, red and other colors. They are used also for making novelties such as lamp bases, paper weights, ink wells, ash trays and clock cases.

The Bureau of Mines Information Circular 7008 entitled "Verde Antique", by Oliver Bowles and Florence Davidson, describes the composition, origin, early history, uses, occurrences, and methods of manufacture of this interesting mineral product. It describes briefly how the huge blocks are hoisted from the quarries or mines, are sawed into slabs with gang saws or turned into columns in lathes; and how the surfaces are rubbed smooth and then polished to bring out the full effect of the attractive colors and patterns. Copies of the report may be obtained by addressing requests to the Bureau of Mines, Washington, D. C.

SOME RECENT FINDS AT TILLY FOSTER

By PETER ZODAC,

Editor, ROCKS and MINERALS.

Tilly Foster, that grand old magnetite mine in southeastern New York, which was abandoned many years ago, can still yield interesting minerals if its extensive dumps are carefully searched. On Sunday, May 23rd, 1937, while returning from the Rocks and Minerals Association outing held at the Strickland Quarry, near Portland, Conn., four collectors, Dr. J. R. Evers, Newton Harris, R. Emmet Doherty, and the writer, stopped at Tilly Foster for a "look see". We had only a few minutes of daylight remaining and during that short interval Mr. Doherty stumbled upon tremolite in a new form.

Tremolite

Tremolite at Tilly Foster is a grayish-blue, massive and very tough mineral. It occurs as a 6-inch vein of very fine quality in a clinochlore schist, associated with pyrrhotite which is especially prevalent near one contact. The pyrrhotite is also of good quality, massive, though it also occurs as tiny stringers. Small masses of chalcopyrite and one tiny mass of molybdenite were imbedded in the massive pyrrhotite.

The tremolite is very tough and it was only with much difficulty and hard labor—using a sledge hammer—that pieces could be broken off. It did not seem possible that the mineral could be so tough—one could hammer and hammer and it would not yield. The total length of the tremolite vein in the schist was about 4 feet and the block had been broken into four parts, each about 6 inches thick, and it was still difficult to extract specimens from them.

On June 30, the locality was again visited with Dr. Evers and the largest slab was finally broken up. Dr. Evers obtained a very fine museum specimen for his collection as did also the writer.

Tremolite from Tilly Foster takes a beautiful polish. Because of the unusual form of the mineral, a specimen was sent to Dr. Alonzo Quinn of Brown University who identified it as tremolite. The writer's thanks are extended to Dr. Quinn for this authoritative identification.

Bronzite

Bronzite is not a new mineral for Tilly Foster as it has been found quite frequently but its occurrence was such that specimens could be found only at rare intervals. But when the locality was visited with Dr. Evers, Wednesday, June 30, 1937, bronzite was not only found again but what was more remarkable search for it revealed that it was actually present in huge masses—up to 4x4 feet—and at least twelve such masses were counted.

Bronzite is the ferriferrous variety of enstatite and that found at Tilly Foster varies from coarse-crystalline (the most common) to fibrous, to lamellar masses, of a gray green to dark green color with lustrous faces.

It is apparent from the study of the mineral, and especially of the huge blocks, that only the exposed faces and edges acquire the bronzy luster for which the mineral is noted. Some of the finest material found here were small pieces buried in the ground with one face exposed. It is this exposed face of a buried specimen which has the most beautiful luster—far more beautiful than the face of a mass perched high above the ground. Examination of a block shows that it is the topmost face which is especially bronzy. The sides of exposed faces are weak and often do not show the luster which penetrates a block for only about ¼ to ½ inch.

Bronzite is very tough—unusually so when in large blocks—and specimens can be extracted only with much difficulty. The tremolite is tough but the bronzite is tougher and unless a corner or an edge is present it is practically impossible to break off a piece. At the time of our visit, when the writer spied the first block far up off the ground, he immediately proceeded to work on it. He pounded and pounded, with the sledge-hammer, until he was almost exhausted and still the rock would not yield.

"Doctor", he panted, "if you paid me $25 an hour for this work I'd quit within 5 minutes but because its gratis I keep pounding away."

A few minutes later while lustily pounding a corner, a piece flew off which struck his shin so smartly as to double him up with pain. Fortunately the leg was not broken nor was his spirit as he soon hopped up upon the block and began pounding again but more cautiously. It is this extreme toughness of bronzite which assures the writer that no matter how many collectors pound away at the huge masses, the mineral will never be exhausted because very few specimens will be extracted.

Bronzite takes a beautiful polish and can be used for gem stones or for ornaments.

Serpentine after clinochlore

Another interesting mineral found June 30, 1937, was a large cleavable mass of gray dolomite (the finest the writer ever saw from here). When broken open it was found to be penetrated by thin sheets of grayish-blue (almost robin-egg blue) serpentine with a dull luster. This had us stumped for a while but some few minutes later we picked up a loose piece of the same material also associated with dolomite. In the center of the serpentine were thin sheets of clinochlore, in fact there was a gradual transition of the clinochlore into serpentine. Therefore the serpentine is a pseudomorph after clinochlore but we could not account for its blue color.

JOHN MELHASE

JUNE 29, 1885—APRIL 9, 1938.

Mineralogical circles in America were shocked by the sudden death from heart failure of John Melhase, one of California's foremost geologist and mineralogist. At the time of his death, April 9, 1938, Mr. Melhase was engaged on a geological survey near Redding, Calif., for the Southern Pacific Railroad Co.

Mr. Melhase was born in Hannibal, Missouri, on June 29, 1885, the son of the late Mr. and Mrs. Al Melhase. He was a graduate of the Oregon Agricultural College and his entire professional career was connected with the Southern Pacific Railroad Co. He travelled extensively through the western states, for the company, which not only gave him the opportunity to visit many mines, quarries and other mineral localities from which many fine specimens were obtained but he also made many friends and acquaintances who will deeply regret his passing.

Mr. Melhase was primarily interested in the study of minerals and was the owner of the second largest private mineral collection on the Jacific Coast and also of a very fine collection of type crystays. He was the first President of The California Federation of Mineralogical Societies, retiring from that office only this year. He has written a number of articles for mining, mineralogical, and other scientific publications. He was a member of the Le Conte Club, the California Academy of Science, the Mineralogical Society of America, The California Federation of Mineralogical Societies, and the Rocks and Minerals Association.

Mr. Melhase is survived by his widow, Mrs. Margaret Melhase, and his daughter, Margaret, of 675 Vincente Ave., Berkeley, Calif., and by two sisters, and three brothers, Mrs. Emma Dunham, Mrs. Edna Robertson, William Melhase and Dan Melhase, all of Klamath Falls, Ore., and Fred Melhase of San Jose, Calif.

"MOSS" CHIASTOLITE IN MASSACHUSETTS

By JOHN H. BRODRICK

Clinton, Mass.

A few years ago the writer in spending an afternoon on George Hill in Lancaster, Mass., looking for chiastolites, ran across a boulder containing perhaps sixty or seventy crystals of this mineral. The crystals did not appear interesting as they were of a dull waxy or soapy luster. A few, however, were of good size and had good figures. What interested the writer more than anything else was that the boulder was sandstone. He had never found chiastolites in sandstone before that he could remember.

The writer is not a mineralogist, and knows practically nothing about minerals in a technical way. He has, however, collected chiastolites for over forty-five years in the Lancaster Locality, but knows them only from observation, and from cutting and polishing them. As they are all different, one can spend a life-time building up a collection of them. They seem to be affected by all the other minerals anywhere near them. The reason for the many different shades and colors is due to enclosed impurites. While we can read about their occurrence and what elements they are composed of, the writer has never read of how the pretty crosses and flower-like designs ever came to be put in them.

Getting back to that sandstone again. The writer's son, John, was with him on the trip so the sandstone was put in the car and taken home. In breaking it up to get the crystals out, the stone crumbled considerably, and the grit granulated like very fine gravel-sand.

The crystals were very dull (almost blank). So they were put in a box to be thrown away. In November of 1936, when it got too cold to go prospecting, the writer was cutting and polishing some specimens, when he noticed one of the largest of the specimens taken from the sandstone laying on the bench. Picking it up he cut a thin slice off it and held it to a light. (They are transparent when cut thin.) He was very much surprised to see what appeared to be a plant or bush in it. Also what looked like a long fern with many more little plants around the outside edges. The writer has seen moss agate and moss opal, and these funny things looked just like them.

Wanting to know more about this interesting occurrence, the writer wrote a note to Prof. Palache of Harvard University, Cambridge, Mass., inclosing a picture and a speciman. In answer the Professor wrote: "I cannot say that I have ever seen anything like it. I take it that the presence of the mica in this specimen with the spaces which they offer for solutions accounts for the dendrites. Dendrites form in any crack in any kind of material. The dendrites show up very distinctly."

A student from Amherst College visited the writer and was shown the specimen. On returning to the College he spoke to the head of the Geology Department, Prof. Gordon, about seeing this "Moss" Chiastolite. The Professor said he had no knowledge of this particular type of chiastolite. Prof. Gordon is a native of Clinton, Mass., and is very familiar with the Lancaster chiastolites.

The writer also showed the specimen to Dean Homer P. Little of Clark University, Worcester, Mass. Dean Little said: "I have never seen or heard of one before."

Perhaps some of the readers of **Rocks and Minerals Magazine** could tell us something about this rather strange specimen.

On Sunday, May 23, 1937, the writer with his son, John, and a friend, Mr. Martin Cannon, attended the Outing held by the Rocks and Minerals Association at the Strickland Quarry in Portland, Conn.

It was a wonderful day, and a wonderful crowd. People spoke to you as if they always knew you. If you did not find any specimens they would give you some. The writer met people from six states, and everyone talked minerals. It was a perfect day. Meeting several professors there, they were shown the "Moss" Chiastolite and all of them said they had never heard of such a feature in chiastolites. Many of the members looked at the specimen. It was the writer's first trip to a quarry.

Prof. Palache wrote in his letter to the writer that the chiastolites in the Lancaster Locality have considerable mica in them. But the writer never found any completely altered to mica until three years ago. When he broke up his first boulder containing chiastolites altered to mica he found specimens that were strange to him. Different colors, different shades and much clearer. Some of them inclined to be white or purple are almost like a liquid substance. They are surely the class of our local chiastolites.

About all our local chiastolites are now found in stonewalls, in boulders that are a Slate schist. Sometimes you will find them in clay-stone but not very often. You may find some in out-cropping ledges. But when the Glacier came this way it took the tops of the ledges and scattered them over the fields and woods in pieces. The Indians found them there and left them there. Like their cousins in far off California, they knocked the crystals out and wore them as charms, to bring them good luck in fishing and hunting, and to drive away evil spirits. That is what the first settlers tell us. The first settlers found the boulders all over their land. To raise their crops they had to remove these rocks and boulders, so they carried or hauled them away and built walls for boundary lines or to keep the cattle either in or out of the fields.

It is in these stonewalls you have to look for your specimens. Thirty or forty years ago many collectors and students roamed along them gathering specimens. Thousands of specimens were collected. Many walls were torn down and the stone used for foundations in local buildings. Some were used later as ballast for our improved highways. It all went to make it a longer hunt for good specimens. There are still many specimens left, but good ones are not so plentiful.

Boston Mineral Club Holds Field Trip

The April field trip was held on Sunday April 24, 1938 at Blueberry Mountain Trap Rock Quarry (now working) Winchester Highlands, Mass.

The party met at the Woburn R. R. Station at 10:30 A.M. and proceeded to the quarry. After collecting for several hours, time was called for lunch. By a vote of the majority present it was decided to visit the abandoned Lime Pit at Newbury, better known as the Devil's Den, where the balance of the day was spent.

At the Winchester Locality the following minerals were found: Albite, allanite, babingtonite, calcite, epidote, orthoclase, perthite, chalcopyrite, heulandite, magnetite, molybdenite, prochlorite, iron pyrite, quartz, and titanite.

At the Newbury locality the following minerals were found: Asbestos (serpentine), serpentine, garnet, arsenopyrite, and iron pyrite.

It was a beautiful day and the trip was enjoyed by approximately 35 members.

Henry G. Savags,

Chairman—Field Trip. Comm.

THE AMATEUR LAPIDARY

Amateur and professional lapidaries are cordially invited to submit contributions and so make this department of interest to all

AN INLAID TABLE TOP

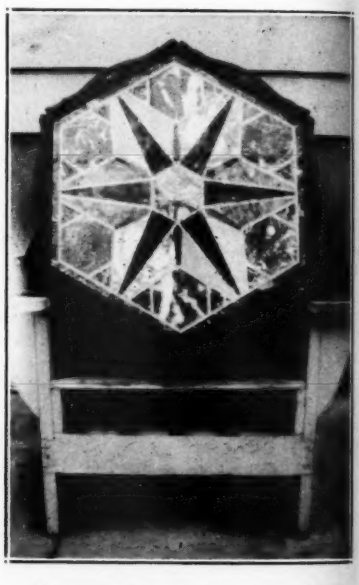
By W. H. OTERSEN
Ex-Pres. New Haven Mineral Club

The lapidary art as a hobby is a most fascinating one and will fill your spare hours with a great deal of pleasure and satisfaction which often allows you to make articles of much beauty and usefulness for the home. It must be well understood, however, that some objects require much time and patience in their making but this is often well repaid by the attractiveness and merit of the finished product.

After three years of experience in the art of cutting and polishing semi-precious stones and marbles under the tutelage of Mr. John Vlismas, during which time I used one of his Stonecrafter's machines for the making of spheres, ash trays, cigarette boxes, book ends, picture frames, etc., I became more ambitious. I wanted to make an inlaid table top. His reply to my query was, "If you have the patience, it can be done."

I had the patience and the inclination and in time the table top was finished. There was no tricky nor unusual operation in its construction but each piece presented its own problem.

Laying out the design was the first important step. Then the various materials which were to be used to get the desired color and finished effect were selected. Material of approximately the same hardness must be used as you must keep in mind that when finished, the entire surface should lend itself to be ground and polished evenly. The work should start from the center and progress outward, making sure that each piece is of the same thickness, is well cemented, and that the joints are even and make a close fit. After all pieces are cut out, assembled, and well cemented, the surface may be polished at a marble yard where machines suitable for polishing large surfaces are available.



The Finished Inlaid Table Top.

The table top in the illustration is 36x16 inches in size and consists of over one hundred pieces of cut out and

assembled marbles and minerals (22 varieties) cemented on a slate base.

The 22 varieties consist of 21 marbles and 1 mineral (malachite) as follows:

1. Portoro ..... Italy
2. Marion Gray ..... Italy
3. Royal Red ..... Italy
4. Tinos Green ..... Greece
5. Breche DeAlope ..... France
6. Crocidolite Green .... Switzerland
7. Malachite ..... Belgian Congo
8. Red Levanto ..... Italy
9. Verona ..... Italy
10. Escalette ..... France
11. Brocatelle Violet ..... France
12. Red Numidian ..... Italy
13. Siena ..... Italy
14. Jasper Vermont ..... Vermont
15. Breche Oriental ..... Ita'y
16. Skyros ..... Greece
17. Veri Corail Clair ..... France
18. Benou Jaume ..... France
19. Fleur de Pas ..... France
20. Jasper Rubane ..... ?
21. Zanzanban ..... France
22. Belgium Black ..... Belgium

BOOKS

Story of the Gems, H. P. Whitlock...$ 3.65
Getting Acquainted with Minerals, Geo. L. English 2.65
Minerals of N. Y. City, J. G. Manchester 2.65
How to Study Minerals, E. S. Dana .. 2.15
Hand Book for the Amateur Lapidary, J. H. Howard 2.00
Dana's Text Book, Wm. E. Ford 5.75
Dana's System of Mineralogy 15.50
Fluorescence of Minerals, Chester B. Slawson ..... .55
How to Collect Minerals, Peter Zodac 1.00
The Book of Minerals, Dr. A. C. Hawkins 1.50
Fossil Penn. Coal Flora of Northern Ill., A. C. Noe. Fine illustrations 1.00
Field Book of Common Rocks, Prof. Fred B. Loomis 3.65
Dana's Manual, Wm. E. Ford 4.25
The World Minerals, L. J. Spencer, 40 colored plates 5.25
Praktikum der Edelsteinkunde. By George O. Wild, in German. Price..... 2.65
Bulletin No. 180. Franklin Minerals... .60
Jewelry Gem Cutting and Metalcraft. By Wm. T. Baxter (out May 1938) 2.65

John A. Grenzig

299 Adams St. **Brooklyn, N. Y.**

Bibliographical Notes

Fine Mineral Specimens: Ward's Natural Science Est., Inc., 290 Goodman St., North, Rochester, N. Y., have recently issued another price list—Fine Mineral Specimens. The new list features choice specimens of rare and common minerals for collections and museums; also includes a brief listing of cut gems and of minerals suitable for cutting and polishing. 24 pp.

Hiking Trips in Northeastern States: This is a little booklet listing one-day week-end and vacation hiking trips (May-Sept. 1938) in north-eastern states. Issued by the Hiking Trips Bureau, Ernest A. Dench, Director, Ho-ho-kus, N. J., price 10c.

Geologic Charts: The two geologic charts which appeared with Mr. Reimann's very interesting article, **Fossils and Fossil Collecting,** on pages 83 and 84 of the March, 1938, issue of ROCKS and MINERALS have created considerable interest. Copies of the original charts, size 16 x 20 inches, (the two small charts are on one large one) cost $2.00 and may be obtained from The Buffalo Museum of Science, Humboldt Park, Buffalo, N. Y.

FOSSILS AND FOSSIL COLLECTING

By IRVING G. REIMANN

Curator of Geology, Buffalo Museum of Science

Part IV. Petrifaction by Infiltration.

An easily performed experiment shows clearly the amount of fleshy material contained in living shells. Place a recent shell minus its contents in a dilute acid (such as **H Cl**) and change the solution frequently. In the course of two or three days the shell will be dissolved, but the form of the shell will still be retained by the soft, spongy, fleshy material which permeated the shell structure.

In nature the reverse of this experiment is generally observed. When the shells become buried, the freshly material decays, while the shell structure remains. (See last month's article in this series.) In the event that the deposit never becomes very thick and free air remains in the sediment, the shells themselves may be completely disintegrated. They may be dissolved, too, by the downward percolation of surface water through the strata.

Frequently after shells have become buried and preserved in a favorable medium, they are subjected to the passage of supersaturated solutions of percolating underground water. These solutions, usually of silica, lime, or iron, penetrate the hollow spaces in the shell and **fill them with the mineral.** This is the first step in the actual petrifaction, or turning to stone, of a fossil. The original structure and composition of the shell (or bone or wood) remains, but the infiltered foreign material has filled up all the cavities. Obviously, such fossils are heavier than the original material. Fossils of this type, petrified by infiltration, are abundant in many Cenozoic and Mesozoic strata but are not uncommon in some of the older formations.

Bones lend themselves well to this method of preservation. The outer layer of bones is hard and dense, but the interior is spongy, filled with branching canals. In life these channels, called Haversian canals, were filled with arteries, veins, and nerves, and they offer free circulation of the mineralizing solution after the decay of the soft tissues. Many of the dinosaur and other vertebrate bones of the Mesozoic era are preserved in this way.

CLUB AND SOCIETY NOTES

New Haven Mineral Club

Outings for the balance of the season of 1938 will be as follows:

June 19 Canton, Conn. — Westfield, Mass.
July 17 Diamond Ledge, West Stafford.
Aug. 21 Long Hill, Trumbull, Conn.
Sept. 18 Bedford, New York.
Oct. 16 Iron Mine, Roxbury, Conn.

On each day of an outing, the group will meet at Peabody Museum, in New Haven, Conn., at 9:00 a. m.

Bridgeport Mineral Club

At the March Meeting of the Bridgeport Mineral Club, held March 21st, at the Public Library in Bridgeport, Conn., the Club voted to affiliate with the Rocks and Minerals Association. On Sun. May 22nd, in cooperation with the National Outing of the Association, the Club held its outing at the old siderite mine on Mine Hill, Roxbury Station, Conn. On Sun. June 5th, the Club will hold a field trip at the old tungsten mine on Long Hill, Trumbull, Conn.

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